UANL
UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN

FIME
FACULTAD DE INGENIERÍA MECÁNICA Y ELÉCTRICA

Unidad de aprendizaje: Métodos Numéricos

Actividad 4.1

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San Nicolas de los Garza, Nuevo León

Newton hacia adelante

$X_0 = 0$

$$g(x) = \Delta^0 y_i + \frac{\Delta^1 y_i s}{1!} + \frac{\Delta^2 y_i s(s-1)}{2!} + \frac{\Delta^3 y_i s(s-1)(s-2)}{3!} + \frac{\Delta^4 y_i s(s-1)(s-2)(s-3)}{4!}$$

$s = \frac{x_0 - x_i}{h}$

X_i	$\Delta_0 y_i$	$\Delta_1 y_1$	$\Delta_2 y_2$	$\Delta_3 y_3$
-3	125	127 − 125 → A = 2	B − A → D = 3	E − D → F = −7
-1	127	132 − 127 → B = 5	C − B → E = −4	
1	132	133 − 132 → C = 1		
3	133			

$h = 2$

$s = \frac{0 - (-3)}{2} \rightarrow x = 1.5$ $\quad s-1 \rightarrow y = 0.5$ $\quad s-2 \rightarrow M = -0.5$

$$g(x) = 126 + Ax + \frac{Dxy}{2} + \frac{FxyM}{6} \qquad g(x) = 129.5625$$

Newton hacia atras

$X_0 = 1.253$

$$g(x) = \nabla^0 y_i + \frac{\nabla^1 y_1 s}{1!} + \frac{\nabla^2 y_i s(s+1)}{2!} + \frac{\nabla^3 y_i s(s+1)(s+2)}{3!} + \frac{\nabla^4 y_i s(s+1)(s+2)(s+3)}{4!} \ldots$$

$s = \frac{x_0 - x_i}{h}$

X_i	$\nabla^0 y_i$	$\nabla^1 y_1$	$\nabla^2 y_1$	$\nabla^3 y_1$	$\nabla^4 y_1$
1	27				
1.1	30	30 − 27 → A = 3			
1.2	32	32 − 30 → B = 2	B − A → E = −1		
1.3	33	33 − 32 → C = 1	C − B → F = −1	F − E → A = 0	
1.4	39	39 − 33 → D = 1	D − C → x = 0	x − F → B = 1	B − A → C = 1

$h = 0.1$

$s = \frac{1.253 - 1.4}{0.1}$

$s \rightarrow A = -1.47$ $\quad s+1 \rightarrow E = -0.47$ $\quad s+2 \rightarrow F = 0.53$ $\quad s+3 \rightarrow Y = 1.53$

$$g(x) = 39 + DA + \frac{XAE}{2} + \frac{BAEF}{6} + \frac{CAEFY}{24} \qquad g(x) = 32.6143$$

Diferencias Divididas

Diferencias en Y's / Diferencias en X's

$$g(x) = D^0 y_i + D^1 y_i (X_0 - X_1) + D^2 y_i (X_0 - X_1)(X_0 - X_2) + D^3 y_i (X_0 - X_1)(X_0 - X_2)(X_0 - X_3)$$

$X_0 = 32$

X_i	$D^0 y_i$	$D^1 y_i$	$D^2 y_i$	$D^3 y_i$
28	215	$\frac{222-215}{30-28} \rightarrow A = 3.5$	$\frac{B-A}{33-28} \rightarrow D = -0.366$	$\frac{E-D}{35-28} \rightarrow F = 0.047$
30	222	$\frac{227-222}{33-30} \rightarrow B = 1.66$	$\frac{C-B}{35-30} \rightarrow E = -0.033$	
33	227	$\frac{230-227}{35-33} \rightarrow C = 1.5$		
35	230			

$X_0 - X_1 = 32 - 28 \rightarrow X = 9$

$X_0 - X_2 = 32 - 30 \rightarrow Y = 2$

$X_0 - X_3 = 32 - 33 \rightarrow M = -1$

$g(x) = 215 + AX + DXY + FXYM$ $\quad g(x) = 225.6857$

Lagrange

$$g(x) = y_1\left[\frac{(x_0-x_2)(x_0-x_3)(x_0-x_4)\dots(x_0-x_n)}{(x_1-x_2)(x_1-x_3)(x_1-x_4)\dots(x_1-x_n)}\right] +$$

$$y_2\left[\frac{(x_0-x_1)(x_0-x_3)(x_0-x_4)\dots(x_0-x_n)}{(x_2-x_1)(x_2-x_3)(x_2-x_4)\dots(x_2-x_n)}\right] +$$

$$y_3\left[\frac{(x_0-x_1)(x_0-x_2)(x_0-x_4)\dots(x_0-x_n)}{(x_3-x_1)(x_3-x_2)(x_3-x_4)\dots(x_3-x_n)}\right] + \dots$$

$x_0 = 3$

x_i	y_i
$1.5 \to A$	2.76
$2.5 \to B$	3.4
$3.5 \to C$	4.09
$4.5 \to D$	4.23

$$2.76\left[\frac{(3-B)(3-C)(3-D)}{(A-B)(A-C)(A-D)}\right] \to E = -0.1725$$

$$3.4\left[\frac{(3-A)(3-C)(3-D)}{(B-A)(B-C)(B-D)}\right] \to F = 1.9125$$

$$4.09\left[\frac{(3-A)(3-B)(3-D)}{(C-A)(C-B)(C-D)}\right] \to X = 2.300625$$

$$4.23\left[\frac{(3-A)(3-B)(3-C)}{(D-A)(D-B)(D-C)}\right] \to Y = -0.269375$$

$g(x) = E + F + X + Y$ $\qquad g(x) = 3.7762$

Diagrama de Lagrange